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Evaluation of flossing and brushing technique after oral physiotherapy through video observation

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Abstract

Oral physiotherapy is defined as the maintenance of oral hygiene and its objective is the complete and daily removal of the plaque with a minimum of effort, time and devices, using the simplest possible methods. Materials and methods: 30 patients from 18 to 65 years of age, divided into two groups: one without prior instruction and a second group in which the technique of modified Stillman brushing and flossing was explained to them, to be subsequently filmed using a face mirror and to evaluate the brushing time, the effective duration of brushing, the brushing pattern, the order of sextant and the use of dental floss. Results: Despite instruction in hygiene techniques, better results of instruction were found in the control group.

Keywords: Oral physiotherapy, Brushing, Dental floss, Ability

1. Introduction

A worldwide prevalence of periodontal disease has been estimated at 15 to 20% in adults between 35 and 44 years old [1], where in Mexico up to 70% of adults have been reported over 65 years of age [2].

Bacterial proliferation due to oral hygiene deficiency, diseases such as chronic periodontitis can develop [3], where the inflammatory course provides in certain cases changes in bone morphology, promoting the development of periodontal pockets [4] and loss of clinical attachment level [5].

The objective of non-surgical periodontal therapy consists of a mechanical scaling of the dental surfaces [6], in which adequate plaque control is crucial through cooperation and understanding of the patient for long-term success [7].

Plaque control is the regular removal of dental plaque and the prevention of its accumulation on dental and gingival surfaces [8], therefore it is indicated to the patient a regular brushing with circular, horizontal and vibratory movements [9], where has reported a long-term success with the use of dental floss [10], however today it has been found that only 45% of patients manage to understand and have the skills to carry out oral hygiene techniques and only the 25% successfully achieved the use of the floss [11].

The objective of the present study was to evaluate by video observation the understanding and the skill of the patient to replicate oral hygiene measures, including brushing technique and dental floss after oral physiotherapy.

2. Materials and methods

2.1 Population and study design

Due to the variables to be studied, the sample size was estimated with the application of the

$$n = \frac{z^2 pq}{e^2}$$

quantitative formula, being $z = 1.96$ for 95% reliability, $p = 0.35$, $q = 0.65$ and $e = 14\%$, obtaining a sample number of 30, with a total of 10 patients for the control group and 20 for the experimental group.

The design of the study was comparative, experimental, where patients were obtained for the first time at Graduate Periodontics Program, School of Dentistry, Universidad Autónoma de Nuevo León. The study included patients from 18 to 65 years of age, ASA I [12].

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The study were divided into two groups: the control group were performed by students from the School of Dentistry, Universidad Autónoma de Nuevo León and for the experimental group were selected patients who attended for the first time the Graduate Periodontics Program, School of Dentistry, Universidad Autónoma de Nuevo León. Were excluded from the study patients ASA II, III and IV, pregnant or lactating patients, smokers and oral respirators, patients with some physical disability to perform oral hygiene techniques were excluded from the study also patients who have previously attended the Periodontics Postgraduate Program. Patients who did not continue with the study were eliminated, as well as those who presented gingivitis, periodontitis, fixed bridges and orthodontic retainers during their evaluation, as well as those recordings where oral hygiene techniques could not be evaluated correctly.

2.2 Facial mirror development

To carry out the experimental studies, a mirror with an included camera was prepared to film the oral hygiene techniques of the patients. For this, a conventional facial mirror of 50 x 30 cm size was acquired, to which 1 cm² of the metal part that gives the bottom of the mirror was removed by the back so that it could adapt the spycam camera (Kentucky, USA), another hole for the remote control sensor and a pre-recording indicator hole, which was adapted and fixed in the back of the mirror. The camera was connected to the electric light and tests were carried out for its correct functioning (Fig. 1).

2.3 Standardization of brushing technique

For the brushing technique instruction, patients were instructed with modified Stillman brushing technique, which was instructed according to the original technique: the ends of the bristles were placed on the cervical portion of the teeth and partly on the gingiva contiguous, pointing in an apical direction and at an oblique angle with respect to the longitudinal axis of the teeth, the brush should be activated with 20 short reciprocating movements.

The occlusal surfaces of molars and premolars are cleaned with bristles perpendicular to the occlusal plane and penetrating the sulcus and interproximal spaces. To carry out this technique, the patient was given a brush no.526 GUM®.

For the floss technique the patients were instructed to cut 30 to 45 cm of the Expanding Floss (GUM®) thread, then roll around the fingers, the thread is tightened firmly between the thumb and the middle finger and is advanced with each contact area. Once the thread is below the point of contact, the tooth is surrounded with the thread, moving it firmly towards the inside of the sulcus and towards the coronal, repeating it several times.

Once standardized, a patient's clinical history was performed to later explain the study through informed consent and instruction in oral hygiene techniques with a typodont, except for the control group, to whom the brushing and flossing technique was not explained.

2.4 Monitoring of oral physiotherapy

Once the technique was explained, the patient returned to the second appointment with the required brush and thread, placed the patient approximately 30 cm in front of the mirror and performed the brushing technique to be filmed and analyzed by the Final Cut Pro® program (Macintosh, Apple).

2.5 Filming analysis

Once the patients were filmed, they were reviewed through the Final Cut Pro® program (Macintosh, Apple) and the following points were analyzed, which were given a number value for their tabulation:

- a) **Brushing time:** Time between the first brush contact with the tooth, until the last brushing action (min).
- b) **Effective brushing duration:** Effective time in which the patient dedicates time to brushing without interruptions such as rinsing, spitting or resting (min).
- c) **Brushing Pattern:** Five brushing patterns were standardized depending on their similarity to those found in the video they were classified into: *Circular* movement of the brush head and ends of the bristles into one or two sextants, *Horizontal-Linear* anterior and posterior movement in horizontal direction, parallel to the axis of occlusion, *Vertical-Linear* movements of cervical to coronal area, parallel to the dental axis, *Vertical-Revolving* the movement is parallel to the dental axis with an additional rotary movement on the same axis of the tooth, unspecific if it could not be assigned to none of the previous categories.
- d) **Order of sextant:** Complete if the patient started a sextant and finished brushing, Incomplete if the patient started a quadrant and did not finish.
- e) **Flossing:** When the thread was threaded in the interproximal space, vertical movements were made (up and down) parallel to the tooth axis at least twice. Inadequate horizontal movements, without movement (brief insertion in the interproximal space and immediate removal).

Ethical considerations

The study was approved by the Bioethics Committee of the School of Dentistry, Universidad Autónoma de Nuevo León, where each patient was given informed consent prior to making the clinical history.

Analysis of data

For the analysis of results, the goodness test and an analytical model were used to verify hypothesis tests using the Chi square test, both tests were performed with 95% reliability (IBM SPSS Statistics, Version 20, USA and Microsoft Excel 2010).

3. Results & Discussion

Oral physiotherapy monitoring

When reviewing the recordings through the Final Cut Pro® program (Macintosh, Apple) no filming errors were found and they were reviewed in their entirety to evaluate all aspects:

- a) **Brushing time:** In the evaluation of the brushing time it was found that the average time in the experimental group was 3:05 minutes and in the control group it was 5:36 minutes.
- b) **Effective brushing duration:** The effective brushing time was evaluated, that is to say the time in which the patient dedicate time to the brushing without interruptions such as rinsing, spitting or resting or change of hand, here a significant difference between both groups was found ($p = 0.002$), since that in the control group the average was 5 minutes with 28 seconds and in the experimental group it was 2 minutes with 51 seconds (Tab. 1).

- c) **Brushing pattern:** It was found that 60% of the patients in the control group performed a linear vertical pattern and 40% a vertical rotating pattern, while the experimental group performed a vertical rotary pattern (10%), a linear vertical pattern (45%), a linear horizontal pattern in 5% and a nonspecific pattern in 40% ($p=0.217$). (Tab. 2).
- d) **Order of sextant:** When evaluating the sextant order, it was evaluated if the patient started the sextant and finished it (complete), or if the sextant was not finished (incomplete), where a significant difference was found (p

= 0.008) since 55% of the patients of the experimental group managed to complete the sextant, unlike the control group where 90% of the patients finished the sextant (Tab. 3 and Figure 2).

- e) **Flossing:** During the review of the filming, the use of dental floss was evaluated, being adequate in 25% of the experimental group and in 60% of the control group, and inadequate in 75% of the experimental group and 40% of the control group, obtaining results statistically significant ($p=0.0281$) (Tab. 4).

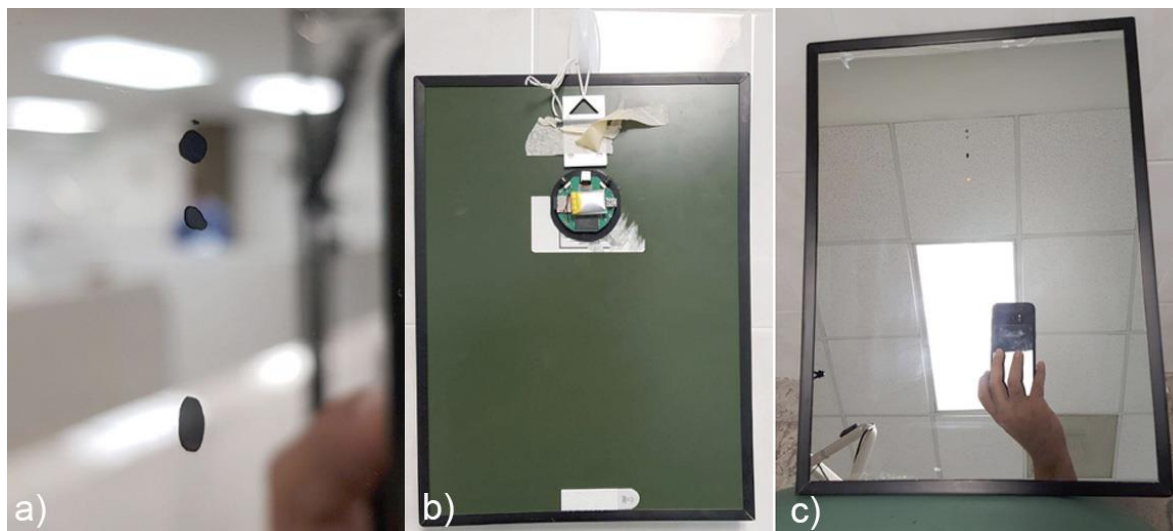


Fig 1: Development of facial mirror. a) View showing the mirror showing the three holes for the adaptation of the camera, b) Rear view of the adaptation of the camera to the mirror, c) Front view of the mirror with the adaptation of the camera.

Table 1: Averages of the effective brushing time between the study groups.

Group	n	Mean	SD	t	p
Experimental	20	2 min 51 sec	1 min 58 sec	3.35	0.002
Control	10	5 min 28 sec	2 min 6 sec		

Table 2: Evaluation of the brushing pattern according to the study group ($t = 0.786, p=0.217$).

Pattern	Control		Experimental	
	n	%	n	%
Inespecific	0	0.00	8	40.00
Horizontal-Linear	0	0.00	1	5.00
Vertical-Linear	6	60.00	9	45.00
Vertical-Rolving	4	40.00	2	10.00
Total	10	100	20	100

Table 3: Order of the sextants according to the study group ($t=2.39, p=0.008$).

Pattern	Control		Experimental	
	n	%	n	%
Complete	9	90.00	11	55.00
Incomplete	1	10.00	9	45.00
Total	10	100	20	100

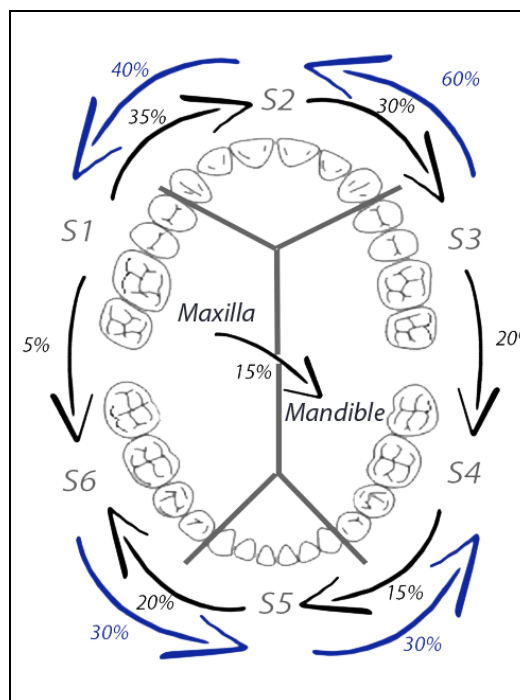


Fig 2: Sextants order.

Table 4: Evaluation of the use of dental floss according to the study group ($t=1.961$, $p=0.0281$).

Patrón	Control		Experimental	
	n	%	n	%
Adecuado	6	60.00	5	25.00
Inadecuado	4	40.00	15	75.00
Total	10	100	20	100

4. Discussion

The objective of the present study was with the clinical purpose of qualifying the understanding of the technique and not its effectiveness, this with the intention of improving our physiotherapy instructions, having as vision for future applications an improvement in the simplified oral hygiene index and a better result in our periodontal treatment, with the patient being the main beneficiary.

Currently there are not enough studies to reveal the brushing pattern of the patients by video filming, however Winterfeld *et al*, in 2014 has evaluated the brushing pattern, the total time and the effective time of brushing and flossing, where by means of a video camera he found that: the total brushing time was 2:07 minutes, where 63% brushed more than 2 min. He also noted that the majority of patients completed the brushing cycle with the exception of the occlusal surfaces and the most common brushing pattern was the horizontal and circular type, which differs from our study, since the most predominant was the vertical lineal in both groups^[13].

Harnacke *et al*, 2015 have found through video filming that the total brushing time is 100 seconds, being less than our study and that of Winterfeld^[14]. Ganss *et al*, 2017 after the video evaluation of physiotherapy in patients they concluded that in the vast majority of patients the use of a manual brush results in incomplete brushing of the tooth surfaces^[4].

Garza in 2009 In a study in the population of the state of Nuevo León, México, observed significant difference between the average of the periodontal index obtained by sextants, emphasizing that sextants with lower periodontal index were the 3rd and 5th similar with the results of our study where the majority of patients brushed with emphasis the 3rd and 5th sextants^[15].

5. Conclusions

Given the results of the present study it can be concluded that the average brushing time in the experimental group was 3:05 min and in the control group it was 5:36 min, of which a brushing time of 5:28 was effective. In the control group and 2:51 in the experimental group. The most commonly used brushing pattern was linear vertical with 60% in the control group and 45% in the experimental group. Despite the instruction to the experimental group it was found that only 55% of the experimental group managed to complete the order of sextant, unlike the control group with 90%, in addition only 25% of the experimental group managed to correctly use the dental floss, unlike the control group with 60%. The control group had an evident constancy in the brushing technique although 10% presented deficiencies. By means of this methodology we can demonstrate the efficiency obtained by instructing a specific brushing technique to patients only with a typodont, probably some additional visual method, such as assisting the patient when performing the technique in front of a mirror, computer animation or printed brochures would reinforce the skill with which patients practice oral physiotherapy.

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